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X-Ray Fluorescence Molecular Imaging with Improved Sensitivity for Biomedical Applications

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Abstract : X-ray Fluorescence Molecular Imaging (XFMI) holds great promise as a low-cost molecular imaging modality for biomedical applications with high chemical sensitivity. However, for in vivo biomedical applications, a key technical bottleneck is the relatively low chemical sensitivity of XFMI, especially at a reasonably low radiation dose. In laboratory x-ray source based XFMI, one of the main factors that limits the chemical sensitivity of XFMI is the scattered x-rays. We will present our latest findings on improving the chemical sensitivity of XFMI using excitation beam spectrum optimization. XFMI imaging experiments on two mouse-sized phantoms were conducted at three different excitation beam spectra. Our results show that the minimum detectable concentration (MDC) of iodine can be readily increased by five times via excitation spectrum optimization. Findings from this investigation could find use for in vivo pre-clinical small-animal XFMI in the future.

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